FRQ3) Rate of fuel consumption $R(t)$

| | $t$ min | $R(t)$ gal/min |
|---|---|---|
| $x_0$ | 0 | 20 |
| $x_1$ | 30 | 30 |
| $x_2$ | 40 | 40 |
| $x_3$ | 50 | 55 |
| $x_4$ | 70 | 65 |
| $x_5$ | 90 | 70 |

a) approximate $R'(45)$

Approximate value of derivative with average rate of chg (slope)

$R'(45) \approx \frac{R(50)-R(40)}{50-40} = \frac{55-40}{10}$

$= \frac{15}{10}$ gal/min/min

b) the rate of fuel consumption is increasing FASTEST at $t=45$. what is $R''(45)$?

$R'(t) \leftrightarrow \max$

$R''(t) = 0$ or undefined

so $R''(45)=0$ because $t=45$ represents a MAXIMUM of $R'(45)$

c) Approximate $\int_0^{90} R(t)\,dt$ using a left Riemann sum with the 5 intervals indicated by - - - table.

gal/min · min

left RS $= \Delta x_0 f(x_0) + \Delta x_1 f(x_1) + \Delta x_2 f(x_2) + \Delta x_3 f(x_3) + \Delta x_4 f(x_4)$

$= 30(20)+10(30)+10(40)+20(55)+20(65)$ gallons

is this $< \int_0^{90} R(t)dt$? [graph is increasing

yes, the left R.S. is LESS THAN the integral BECAUSE $R(t)$ is increasing

part d for $0<b\le 90$ min explain $\int_0^{90} R(t)dt$.

$\int_0^{90} R(t)dt$ is the accumulation of all the instantaneous rates of change between $t=0$ and $t=90$ and represents TOTAL fuel consumed (in gallons) from $t=0$ min to $t=90$ min.

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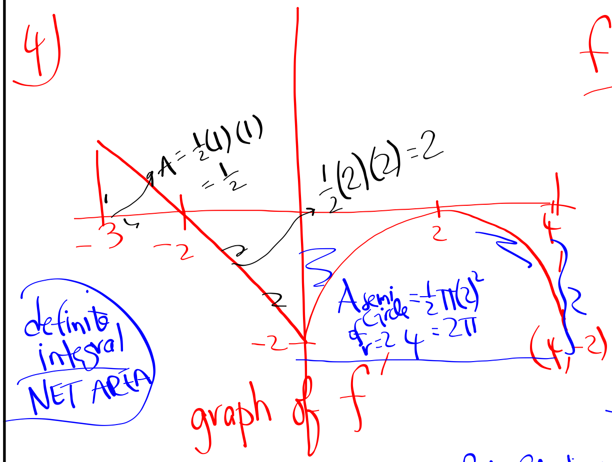
4)

$f(0)=3$




a) $f$ increases when $f'>0$, so $[-3,-2]$

b) x-coord of each pt of inflection.

| $f$ | $f'$ | $f''$ |
|---|---|---|
| c-up | $f'$ inc | $f''>0$ |
| c-dn | $f'$ dec | $f''<0$ |

$x=0$
$x=2$

A pt of inflection (where f chgs concavity) is indicated by $f'$ chging from increasing to decreasing or vice-versa.
or .... $f'$ has a rel max or rel min.

c) eqn of tan line at $(0,3)$
point: DUH
slope: $f'(0)=-2$

$y-3=-2(x-0)$

d) $f(-3)=?$

$f(0)-f(-3)=\int_{-3}^{0} f'(x)\,dx$

$3-f(-3)=\int_{-3}^{0} f'(x)\,dx$

$3-\int_{-3}^{0} f'(x)\,dx=f(-3)$

$3-\left(-\frac{3}{2}\right)=f(-3)=\frac{9}{2}$

$\int_0^4 f'(x)\,dx=$
$f(4)-f(0)$
$8-(2\pi)=f(4)-3$
$11-2\pi=f(4)$

except this is below x-axis